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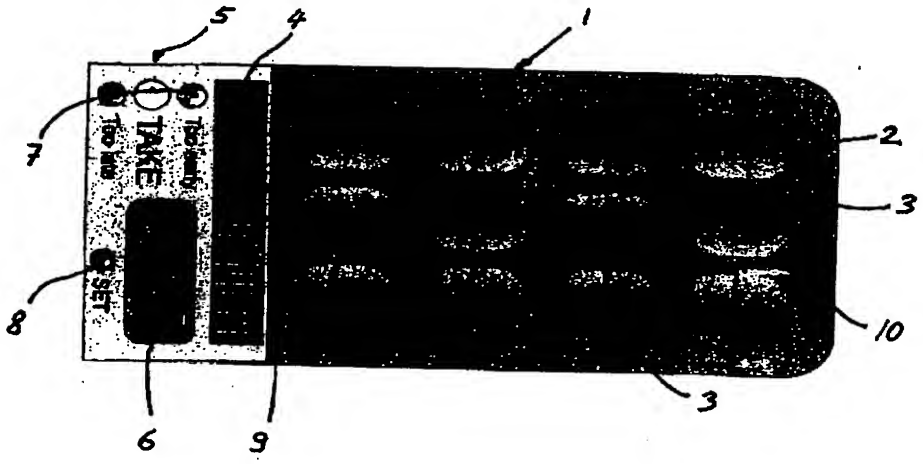
(54) **OPERCULE AVEC BANDES CONDUCTRICES**
(54) **LIDDING FOIL WITH CONDUCTIVE STRIPS**



(57) Medicaments such as tablets are packaged in push-through or blister packs. The packaging exhibits a base with recesses each of which contains one tablet. The base part is covered over by a lidding foil. In order to remove a tablet, the lidding foil is penetrated by the tablet. The push-through pack (1) here is medicinal packaging (1) which can be connected to a computer (5) where the packaging (1) contains a plurality of recesses (2) which are filled with contents such as tablets and at least one conductive strip (3) lies over each recess (2). The overall electrical resistance in the case of one or a plurality of intact conductive strips (3) is from 100 to 100,000 Ω (Ohm) measured between the measuring points which are defined by the points of connection of the computer (5).

Lidding Foil with Conductive Strips

Lidding foil with conductive strips for medicinal packaging which can be connected to a computer where the medicinal packaging features a plurality of recesses that are filled with contents and at least one conductive strip lies over each recess.

These known medicinal containers represent a form of medicinal packaging known in the field as blister pack.

The conductive strips are provided in the lidding foil of such medicinal containers as impulse conductors. Medicinal packaging of this kind, i.e. blister packs in general, are produced in large numbers in a continuous manner on packaging machines. As a rule, in that process a plastic monofilm or plastic film laminate is provided with recesses or cups by a deepening stretching process. The contents such as pills, tablets, capsules, ampoules or the like are placed in the recesses and then sealed in by the lidding foil. As a rule the blister packs are produced in a continuous manner from foils in strip form and, only after filling and lidding, cut to size ready for sale, and if desired placed in an additional form of packaging.

Known e.g. from EP-B 0 129 785 or EP-A 0 796 605 is a device for storage and for reminding a patient to take a require dose of medicament, said device comprising a medicinal pack and a signal generator. On removing a dose of medicament a signal is communicated to a transmitter via an impulse conductor. The impulse conductor is cast into a push-through second foil or the conductive strips are situated on a label which in turn covers the packaging.

Is has been found disadvantageous that the impulses created by interrupting a conductive strip on removing contents from the packaging cannot be reliably recognised by the computer or signal generator.

The object of the present invention is to propose a lidding foil with conductive strips which does not exhibit the above disadvantages, and to describe conductive strips which transmit a reliably recognisable signal to the computer.

That objective is achieved by way of the invention in that the overall electrical resistance at which one or more intact conductive strips is 100 to 100,000 Ω (Ohm), measured between the measuring points that are defined by the contact points of the computer.

Usefully, the minimum overall electrical resistance is 200 Ω (Ohm), preferably 2000 Ω (Ohm), especially preferably 10,000 Ω (Ohm) and in particular 20,000 Ω (Ohm).

Usefully, the maximum overall electrical resistance is 80,000 Ω (Ohm), preferably 70,000 Ω (Ohm), especially preferably 60,000 Ω (Ohm) and in particular 50,000 Ω (Ohm).

The overall electrical resistance may be achieved by the conductive strip or by the conductive strip and at least one additional resistance.

The contact points of the computer represents the interface between the lidding foil with the conductive strips and the contact points of the computer which make contact with the conductive strips.

The conductive strips are situated on a substrate material. The substrate material may be the lidding foil for closing off the base or a label to attach these to the lidding material. The material for supporting the label may be a support foil e.g. a very brittle plastic film such as e.g. a film of polyolefin, polyethylene or polyvinylchloride. The brittleness may be achieved e.g. by addition of filler materials such as e.g. talcum, mica etc. Other plastic films may be films containing acrylnitrile-styrene.

Papers or semi-carton type materials may also find application as substrate material.

Further substrate materials are metal foils or metal foils which are coated on one or both sides with further layers such as organic coatings or plastic films and the like.

The foils/films and papers mentioned above as substrate materials may be employed as further material for protecting the conductive strips. These protective materials may be attached to the support material and cover the conductive strips. Usefully, the labels are made of the same material used for the support and protective layers, this in the interest of avoiding mixed materials.

The material for protecting the conductive strips may also be a in the form of a protective organic coating which is applied by spraying , rolling or brushing, or layers deposited by vapour deposition, vacuum vapour deposition or sputtering.

The conductive strips may be of electrically conductive foil or wires, or an electrically conductive lacquer or powder coating, or a vapour deposited or a vacuum vapour deposited

electrically conductive layer. The electrically conductive lacquer may contain substances that make electrical conductivity possible and lacquer substrates, solvents etc. The electrically conductive lacquer may also be solvent free. The electrical conductivity in lacquers may be achieved by inorganic compounds such as metals or semiconductors e.g. metal powders or dusts in particular silver coated platelet shaped nickel, powders of nickel, iron copper silver etc. or by carbon e.g. in the form of soot, coke and preferably graphite or by oxide mixtures.

Preferred as conductive strips in the present invention are those containing an SiO_2/Sb_2O_3 hydroxide mixture on a mica substrate. Usefully the thickness of the layer of SiO_2/Sb_2O_3 hydroxide mixture on the mica particles is 8 to 20 nanometre advantageously 16 to 20 manometers. The SiO_2/Sb_2O_3 hydroxide mixture on the mica particles represents a conduct-ive pigment on the mica particles. The Sn/Sb ratio amounts to 95:5 to 75:25, a ratio of 85: 15 being preferred. The grain size of the mica may e.g. be from 10 to 100 µm, usefully the grain size of the mica is less than 15 µm. In order that the desired conductive strips can be produced from the electrically conductive pigment, the said pigment must usefully be brought into the form of a lacquer. A lacquer may contain the electrically conductive pigment e.g. the SiO_2/Sb_2O_3 hydroxide mixture on the mica substrate and a binder. Binders that may be employed in such lacquers are e.g. melamine resins, acryl-melamine resins, polyurethane lacquers, nitrocellulose lacquers, acryl-nitrocellulose lacquers etc. The fract-ion of binder in the lacquer may be e.g. from 10 to 60 wt.%, advantageously from 10 to 25 wt.%. Correspondingly, the fraction of electrically conductive pigment in the lacquer may be 40 to 90 wt.%, advantageously 75 to 90wt.%. Apart from the electrically conductive pigment use may be made of a filler such as TiO_2, for example with a grain size equal to or less than 15 µm and in a ratio of electrically conductive pigment to filler of 1:1, or fillers in the form of porous spherical particles with a grain size larger than 30 µm, known under the trade name of LiChrospher by Merck, the ratio of electrically conductive pigment to filler being 1:1.

Lacquers used to create conductive strips may be deposited on the substrate material by brushing, spraying etc. if desired using a mask, or by printing using offset, intaglio, relief or screen printing etc. Further methods for producing electrically conductive strips on the sub-strate material are electrostatic methods, methods using image etching principles, photo-chemical reproduction methods or photochemical printing methods such as e.g. by deposit-ing a fully covering lacquer layer, fixing the conductive strip pattern and dissolving the unrequired areas of lacquer. Other methods for creating conductive strips is to produce layers by vaporisation e.g. in vacuum (chemical vapour deposition, physical vapour

deposition, sputtering). The structuring of vapour deposited electrically conductive layers may be performed e.g. in a step prior to vapour deposition in which a layer is deposited locally and either prevents the adhesion of the electrically conductive layer or prevents the condensation of the vapour. Layers deposited as anti-bonding or anti-condensation layers are e.g. silicone oils deposited in vacuum. A vapour deposited layer may also be masked after deposition and then structure by etching processes. Structuring is also possible by local vapour deposition of the layer using laser or electron beams. A further form of structuring the vapour deposited electrically conductive layer is using a process in which a lacquer that dissolves in a solvent is deposited on the substrate, using e.g. an intaglio, relief or screen printing method, prior to the vapour deposition process. After vapour deposition onto the lacquer coated substrate, the lacquer is removed using a solvent. The vapour deposited layer is of course also removed with the lacquer. The vapour deposited layer remains on the non-lacquered areas of the substrate thus providing the desired pattern of conductive strips.

Apart from the desired pattern of conductive strip or strips on the label, recognition and distance marks or circuits for application of the labels on the blister pack may be provided. Apart from the conductive strips, it is also possible to provide circuits on the substrate material which contain information for the computer that can be evaluated e.g. information concerning the contents of the pack, composition, dosage of the product, cycle in which the medicament is to be taken, expiry date etc.

The conductive strips may be laid in series or parallel over the recesses and, correspondingly, a conductive strip may be laid over all recesses, or one conductive strip may be laid over one or more series of recesses, or each recess may be covered by a single conductive strip and each conductive strip exhibits its own connection to the computer. These conductive strips may communicate its information to the computer by way of a connection.

On the basis of the information from an interrupted conductive strip the computer may start up a time-interval programme that is pre-programmed in the computer or is initiated by a circuit on the label and shows the correct time to take the next tablet and the prescribed times according to the programme. The time at which the tablet was removed can also be registered by the computer and, based on that information the computer can determine the next time a tablet has to be taken and transmit this information via a signal generator. The details of the time of removal may be communicated by way of various commands such as a display showing the time, by coloured light diodes, acoustically by means of a warning signal and the like or by means of a combination of control commands.

If each recess is covered by a conductive strip, the computer is able to determine whether the pack is still intact or, on the basis of the conductive strips that have been interrupted due to removal of medicament, it can calculate the situation regarding medication and from that continue with the appropriate interval of dispensing.

The conductive strips may be situated at least at one place on the medicinal packaging i.e. grouped and arranged such that the computer makes contact there. This site may also be designated as the contact point for the computer. The conductive strips may also close flush with the medicinal pack at least on one side, or they may project over at least one side of the pack, and at this side the conductive strips may be led together i.e. grouped together in such a way that the computer can be locked onto the pack and/or to the label and the conductive strips and the computer contacts are able to make contact there.

The conductive strips in question may also be used on the lidding material for closing or covering over a part of the base for packaging small parts. For example, small parts of a technical nature may be placed in blister packs and the blister packs covered over with a lidding material with conductive strips. On removing individual small parts the conductive strip in the label is interrupted and a security system for unauthorised removal may be activated or, the impulse may be conducted to a computer for storage inventory purposes or the like.

By way of example figures 1 and 2 explain the present invention in greater detail. Figure 1 shows a plan view of a medicinal pack. Figure 2 shows a plan view of another arrangement of conductive strips on a lidding foil.

Figure 1 shows the plan view of a medicinal pack such as a blister pack 1 with recesses 2. A computer 5 is connected to the blister pack 1 by inserting, clamping, locking, snap fitting or other means of contact. Using a slide 4 the clamping connection for example can be activ-ated and the conductive strips 3 terminating at the side-on edge 9 of the blister pack 1 are brought into contact with corresponding contacts in the computer. The resistance of each conductive strip according to the present invention is measured between the measuring points which are defined by the contact points for the computer. In the present example these contact points lie at the side-on edge 9. The computer 5 contains a clock function and represents a store for the changes in the measured overall resistance. The computer 5 features e.g. a time display 6 and - as signal generator - e.g. a display for the time to take the next dose of medicament and/or a generator for an acoustic signal. By means of light diodes 7 the process of reminding the patient may be effected or optically

reinforced. The computer 5 and with that the signal generator can be used several times and can for example be set to zero again by means of a button 8. The conductive strips 3 are situated on the lidding material 10. The connecting points for the computer 5 are provided at the edge 9. The conductive strips 3 on the lidding material 10 lie exactly over the recesses 2 in the blister pack 1. Each recess 2 is covered over by a conductive strip 3. As a result, when a medicament is removed and thereby an interruption made in the conductive strip 3, an impulse can be emitted to the computer 5 or on the basis of the impulses from one, simultaneously a plurality, or all of the conductive strips, the computer 5 can recognise that the medicament has been removed , is due or overdue. The computer is arranged such that the contacts along the edge 9 of the blister pack 1 can be removed.

Figure 2 shows the plan view of a blister pack 1. In that figure the connectable computer is not shown. The blister pack 1 is closed off by a lidding foil 10. The recesses 2 are indicated by circles. A conductive strip 3 is situated over each recess 2. The connecting points 11 for the computer are provided at the edge 9 of the lidding material 10. The conductive strip 3 may be applied e.g. by a printing method. For that reason the conductor strip can have the same thickness over the whole of the lidding foil 10. In order to reach the overall resistance according to the invention, the conductive strips 3 are grouped together in the common broad section 13 and are divided up in narrow sections 14. The narrow sections 14 run over the recesses 2 as conductive strips 3. The resistance in the broad sections 13 is small compared with that of the narrow strips 14. In order to increase or control the resistance of a narrow section 14, the narrow section 14 may be increased in length by means of a loop shape. The narrow sections 14 exhibit a high resistance and on breaking through such a narrow strip 14 when removing a tablet from a recess 2 by pushing through the lidding foil 10, a large change in resistance or impulse is communicated to the computer (not shown) via the contact points 11 and definitely recognised by the computer.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:-

1. Lidding foil (10) with conductive strips (3) for medicinal packaging (1) that can be connected to a computer (5), where the medicinal packaging (1) contains a plurality of recesses (2) which are filled with contents and at least one conductive strip (3) lies over each recess

characterised in that

the overall electrical resistivity, in the case of one or a plurality of intact conductive strips (3), is from 100 to 100,000 Ω (Ohm) measured between the measuring points which are defined by the points of contact of the computer (5).

2. Lidding foil according to claim 1, characterised in that the minimum overall electrical resistance amounts to 200 Ω (Ohm), preferably 2000 Ω (Ohm), especially preferably
10,000 Ω (Ohm) and in particular 20,000 Ω (Ohm).

3. Lidding foil according to claim 1, characterised in that the maximum overall electrical resistance amounts to 80,000 Ω (Ohm), preferably 70,000 Ω (Ohm), especially preferably 60,000 Ω (Ohm) and in particular 50,000 Ω (Ohm).

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Fig. 1

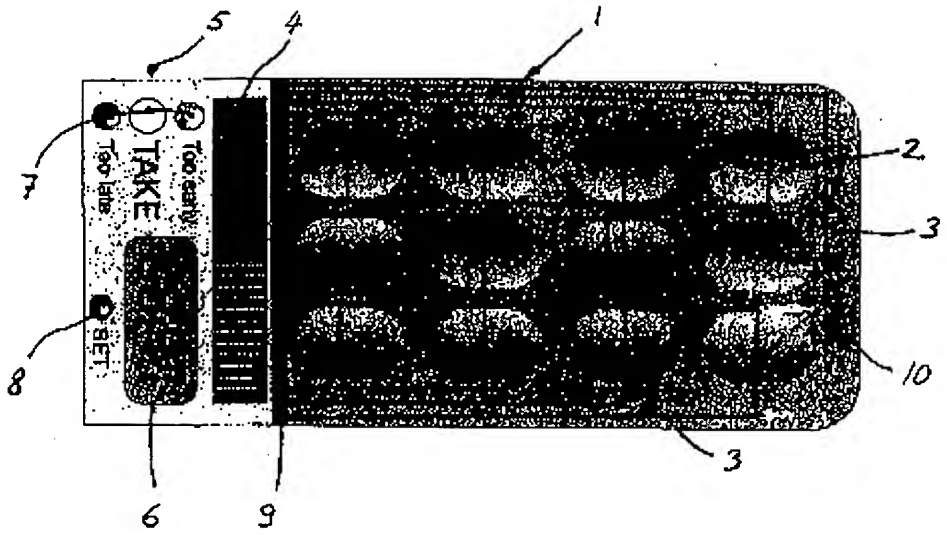

Fig. 2